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# Climate of the Mackenzie Plain

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## WEATHER FEATURES

Favorable for crop growth:

- Summers are warm with a mean July temperature of 65.4°F (18.5°C).
- Over half the yearly precipitation falls during the growing season when the plants need it.
- Long summer days promote rapid development so that crops can mature within the short season.
- Low wind speeds help to minimize evaporation and conserve the limited moisture.
- A stable snow cover protects roots and low plants during the cold, dry winter.

Unfavorable for crop growth and livestock:

- The short growing season limits the crops that can be grown and prolongs the feeding period for livestock.
- Frequent summer droughts greatly limit crop production.
- Unseasonable late spring and early fall frosts sometimes cause severe damage to crops.
- Wet falls frequently delay harvest.
- Long nights and bitter cold in winter cause extreme discomfort to animals and man.

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# CLIMATE OF THE MACKENZIE PLAIN

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The Mackenzie River plain extends from Lake Athabasca northwesterly for 900 miles (1500 km) to the mouth of the Mackenzie River (Figure 1). The whole area is within the northern Boreal Forest and the more northerly part is underlain with permafrost. Only the area south of Fort Good Hope can be considered to have agricultural potential.

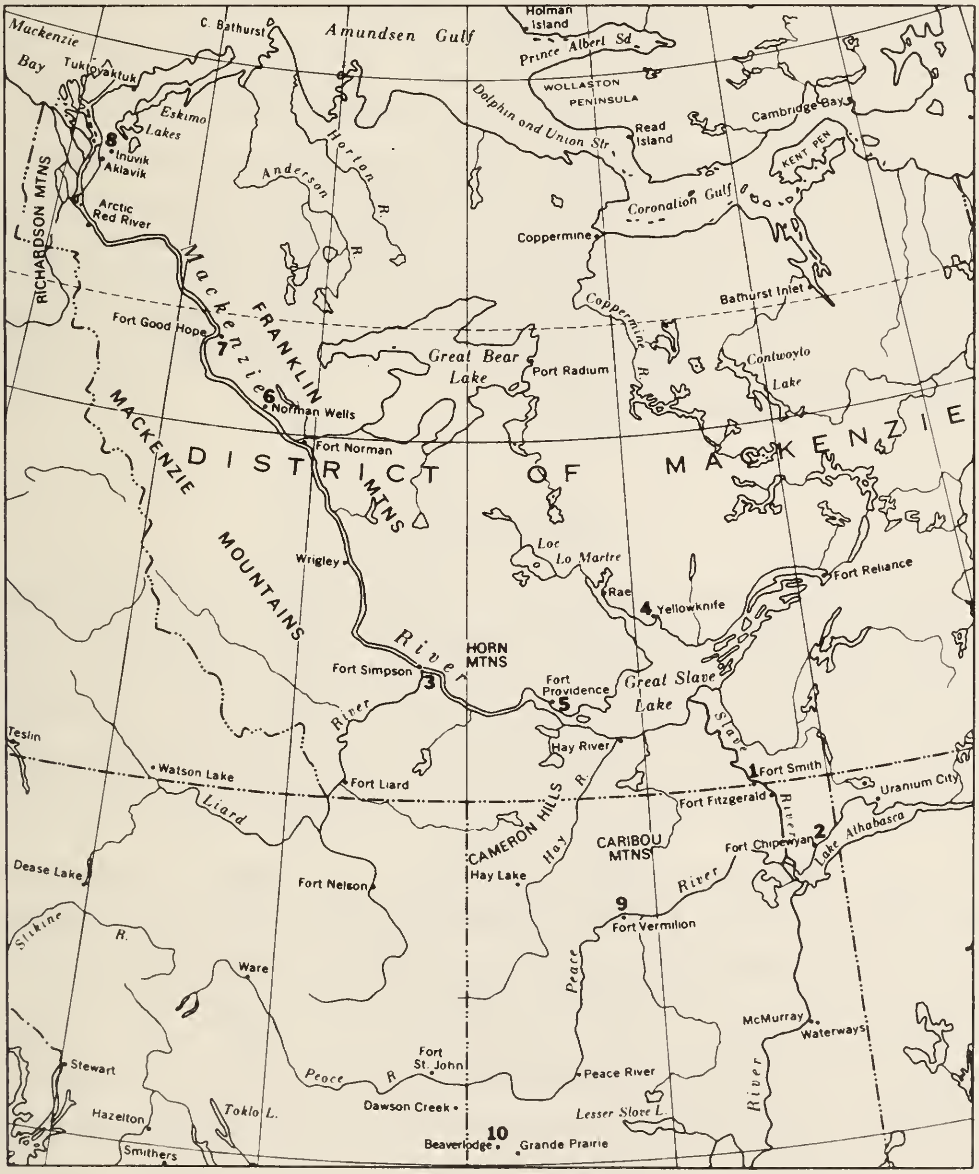

Figure 1. The Mackenzie plain area of northern Alberta and the Northwest Territories.

1. Fort Smith
2. Fort Chipewyan
3. Fort Simpson
4. Yellowknife
5. Providence
6. Norman Wells
7. Fort Good Hope
8. Inuvik
9. Fort Vermilion
10. Beaverlodge

At the broadest, about opposite Fort Simpson (61°50′N), the plain is 225 miles (362 km) wide. It is bounded on the west and south by the Richardson, Mackenzie, and Caribou mountains and the Cameron Hills, and on the north and east by the forest-tundra transition zone.

Three major lakes affect the climate of the plain: Lake Athabasca at the southern end; Great Slave Lake 200 miles (320 km) north; and Great Bear Lake a further 400 miles (640 km) north on the eastern edge of the plain.

The elevation decreases from 714 ft (218 m) at Fort Chipewyan in the south to 50 ft (15 m) at Inuvik in the north. The plain is generally flat with a few isolated hills and mountain ridges such as the Franklin and Horn mountains.

In the past, the many missions and fur-trading posts had extensive gardens, and many raised livestock for local use. With improved transport the need for gardens and livestock was reduced. As a result, many of the gardens and the raising of livestock were discontinued. In recent years, however, there has been a growing interest in agriculture around Fort Smith, Fort Providence, and Fort Simpson.

Agricultural research in the region was centered at Fort Simpson between 1947 and 1970, and there were testing sites at various other locations for varying periods of time (Harris, et al. 1972). Soil surveys have been carried out in the Slave River Lowlands (Day 1972), the upper Mackenzie River area (Day 1968), and the Liard River valley (Day 1966). A total of 4,462,200 acres (1,806,500 ha) of potentially arable land is reported in these surveys.

## HIGHLIGHTS

The Mackenzie plain has a continental climate similar to the lower Peace River region, and thus is subject to irregular extremes of weather. Being further north, the plain has generally lower mean soil and air temperatures and fewer hours of bright sunshine and degree-days than the lower Peace River region (Table 1). However, the long summer days associated with northern latitudes partially compensate for the poorer conditions so that crops require fewer days to mature (Valle and Carder 1962).

The average temperatures during June, July, and August are higher at Fort Simpson (Table 2) than at Fort Vermilion (Carder 1971) and, therefore, are adequate for the growth of cool-season crops. However, unseasonable surges of cold air from the Arctic are more frequent and often shorten the growing season.

Precipitation is lower at Fort Simpson than at either Fort Vermilion or Beaverlodge, but is more than compensated for by a much lower evaporation (Table 1). Fortunately, over half the precipitation occurs during the growing season and can thus be absorbed by the soil and used by the crop. Moisture is, however, a limiting factor in crop production because precipitation occurs irregularly. Periods of drought during the early growing season and excess moisture during harvest cause considerable losses.

On the Mackenzie plain there is considerably less wind than in the Peace River region. The calmest area is around Fort Simpson, which for 21.6% of the time is

**Table 1. Comparison of annual weather records at three locations**

| | Mean temperature | | | | Degree-days above | | | | Precipitation | | | | Evaporation | | Bright sunshine hours daily | Mean wind speed | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Air | | Soil | | 42°F | 5.6°C | 50°F | 10°C | Total | | Snow | | | | | | |
| | °F | °C | °F | °C | | | | | in. | cm | in. | cm | in. | cm | | mph | km/h |
| Fort Simpson | 24.8 | −4.0 | 35.6 | 2.2 | 1,817 | 1,010 | 841 | 468 | 13.3 | 33.8 | 52.1 | 132.3 | 13.3 | 33.8 | 5.0 | 4.8 | 7.7 |
| Fort Vermilion | 29.5 | −1.4 | 40.2 | 4.6 | 2,131 | 1,184 | 1,038 | 576 | 14.3 | 36.3 | 52.5 | 133.4 | 17.1 | 43.4 | 5.6 | 6.1 | 9.8 |
| Beaverlodge | 35.6 | 2.0 | 40.1 | 4.5 | 1,942 | 1,079 | 780 | 433 | 17.5 | 44.4 | 68.5 | 174.0 | 22.5 | 57.2 | 5.8 | 7.9 | 12.7 |

Table 2. Average monthly and yearly weather records for Fort Simpson

| | Mean temperature | | | | Degree-days above | | | | Precipitation | | | | Evaporation[2] | | Bright sunshine | Mean wind speed | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of years averaged | Air | | Soil[1] | | 42°F | 5.6°C | 50°F | 10.0°C | Total | | Snow | | | | | | |
| | 23 | | 9 | | 20 | | 20 | | 23 | | 23 | | 16 | | 19 | 14 | |
| | °F | °C | °F | °C | | | | | in. | cm | in. | cm | in. | cm | Hours daily | mph | km/h |
| January | −18.1 | −27.8 | 17.2 | −8.4 | | | | | 0.7 | 1.8 | 7.6 | 19.3 | | | 1.1 | 3.9 | 6.3 |
| February | −11.0 | −23.8 | 17.6 | −8.0 | | | | | 0.5 | 1.3 | 6.0 | 15.2 | | | 3.3 | 4.4 | 7.1 |
| March | 3.9 | −15.7 | 20.7 | −6.5 | | | | | 0.6 | 1.5 | 6.7 | 17.0 | | | 4.8 | 5.0 | 8.0 |
| April | 24.6 | − 4.1 | 27.8 | −2.3 | | | | | 0.8 | 2.0 | 6.0 | 15.2 | | | 7.1 | 5.4 | 8.7 |
| May | 46.0 | 7.8 | 41.0 | 5.0 | 139 | 77 | 100 | 6 | 0.9 | 2.3 | 1.6 | 4.1 | | | 8.7 | 5.5 | 8.8 |
| June | 57.9 | 14.3 | 55.6 | 13.1 | 460 | 256 | 218 | 121 | 1.6 | 4.1 | – | – | 3.8 | 9.7 | 9.6 | 5.1 | 8.2 |
| July | 65.4 | 18.5 | 61.5 | 16.4 | 610 | 339 | 372 | 207 | 2.1 | 5.3 | – | – | 4.2 | 10.7 | 9.0 | 4.7 | 7.6 |
| August | 58.2 | 14.6 | 58.6 | 14.7 | 490 | 272 | 241 | 134 | 2.0 | 5.1 | – | – | 3.3 | 8.4 | 8.0 | 4.6 | 7.4 |
| September | 45.9 | 7.7 | 45.3 | 7.4 | 118 | 66 | – | | 1.3 | 3.3 | 0.7 | 1.8 | 2.0 | 5.1 | 4.4 | 4.9 | 7.9 |
| October | 29.5 | − 1.4 | 34.9 | 1.6 | | | | | 1.1 | 2.8 | 6.6 | 16.8 | | | 2.8 | 5.2 | 8.4 |
| November | 5.9 | −14.3 | 26.7 | 3.0 | | | | | 0.9 | 2.3 | 9.8 | 24.9 | | | 1.1 | 5.3 | 8.5 |
| December | − 9.9 | −23.2 | 20.0 | −6.7 | | | | | 0.8 | 2.0 | 8.1 | 20.6 | | | 0.5 | 4.1 | 6.6 |
| Year | 24.8 | − 4.0 | 35.6 | 2.0 | 1817 | 1010 | 841 | 468 | 13.3 | 34.1 | 53.1 | 135.1 | 13.3 | 33.9 | 5.0 | 4.8 | 7.7 |

[1] Soil depth 4 in. (10.2 cm) under sod.

[2] Black porous disc converted to 4-ft (122-cm) tank.

without wind. The windiest area is around Yellowknife where for only 6.6% of the time it is calm. At Yellowknife, the percentage of calm is similar at all times of the year, whereas in the other parts of the plain the calmest period of the year is in January.

The worst part of the climate for both humans and livestock is the long, dark, cold winters. The absence of major storm tracks across the region and the presence of forests, however, result in few severe winds, or serious freezing rains, and ice storms. Persistent fogs are unknown, but thick morning fogs sometimes occur, especially in the fall. Ice fogs occur at night during periods of extreme cold.

The ground is covered with snow from mid-October until the end of April as chinook winds are rare and feeble. The snow cover protects low-growing plants from the cold resulting in good winter survival.

## AIR TEMPERATURES

The average mean daily temperature is above 0°F (-17.8°C) from March 7 to November 23 (Figure 2). The warmest period of the year usually occurs in the first half of July, and the coldest is in the first half of January. On the average, the warmest day is July 18 with an average temperature of 64.8°F (18.2°C), and the coldest day is January 9 with an average temperature of -23.2°F (-30.4°C).

Mean daily temperatures on the average are above 32°F (0°C) from April 27 to October 15, and above 42°F (5.6°C) from May 6 to September 24. The period when the temperatures are above 42°F (5.6°C) is usually considered to be the growing season for cool-season crops, and at Fort Simpson it averages 140 days.

Mean maximum temperatures average about 9°F (-13°C) above the mean temperature and mean minimum temperatures about 10°F (-12°C) below the mean temperature. Daily fluctuations between the mean maximum and mean minimum are usually greatest in summer because of the greater intensity of sunlight. On the other hand, differences between the daily extremes are much greater in winter than in summer. The temperature has varied from a high of 42°F (5.6°C) to a low of -64°F (-52.8°C), a range of 106°F (58.4°C) degrees in a single day. The greatest range in summer occurred in July when the temperature ranged from 30 to 94°F (-1.1 to 34.4°C) a difference of 64°F (35°C) degrees.

At Fort Simpson the warmest growing season occurred in 1954 with a mean temperature of 56°F (13.3°C), and the coldest growing season occurred in 1959 with a mean of 50.8°F (10.5°C). July is usually the warmest month. The highest mean monthly temperature of 65.2°F (18.4°C) occurred in July 1964. Temperatures of 90°F (32°C) have not occurred before June 15 or after August 4, and of 85°F (29.4°C) before June 7 or after August 30. The highest temperature of 95°F (35°C) was recorded on July 8, 1953.

The coldest period on record occurred in January 1966 when the highest temperature was -18°F (-27.8°C) and the lowest -55°F (-48.3°C). The mean maximum temperature for the month was -27.1°F (-32.8°C) and the mean minimum was -43.1°F (-42.8°C). The longest period of below 0°F (-17.8°C)

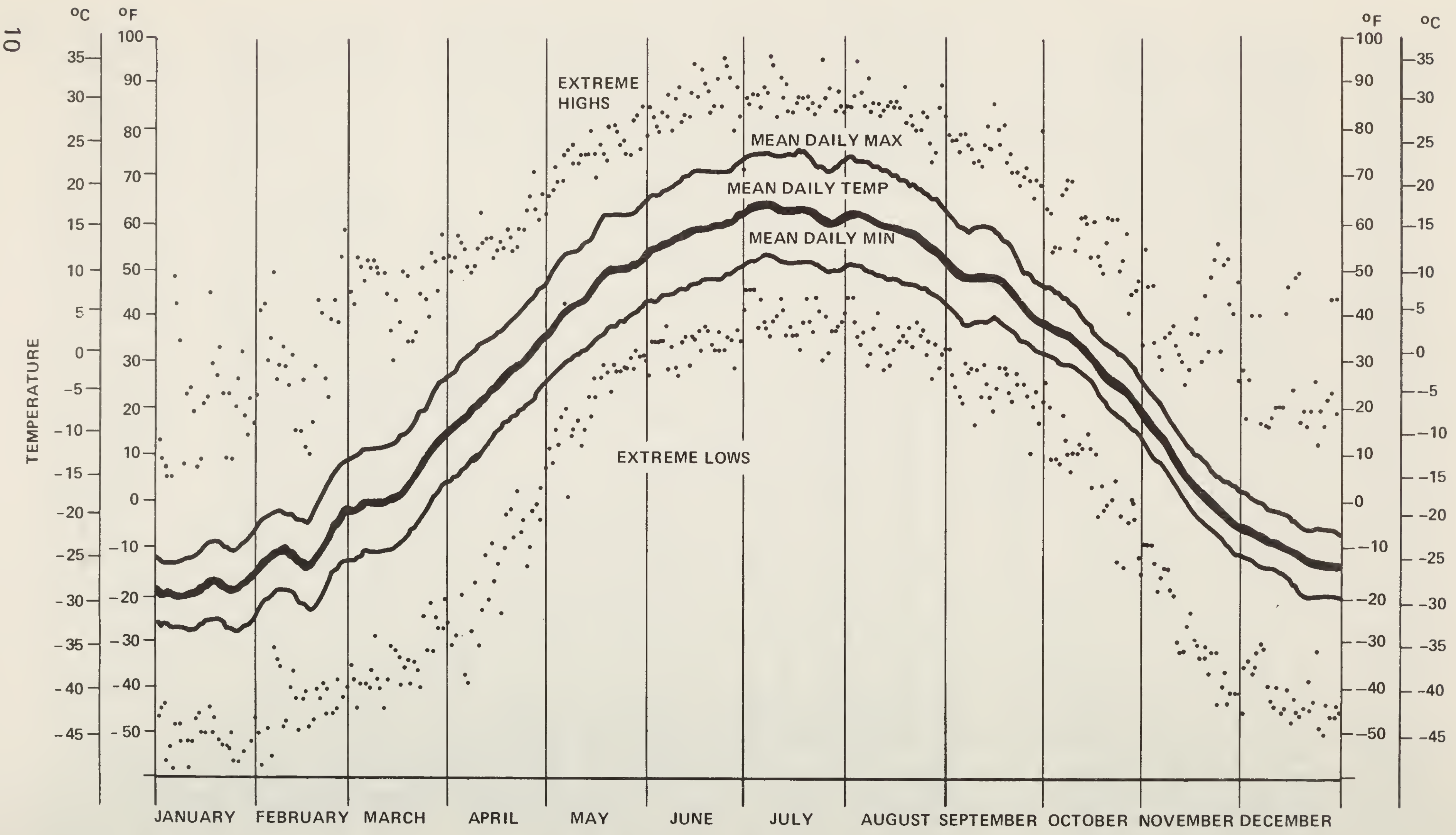

Figure 2. Daily temperatures at Fort Simpson (5-day running averages 1950-59).

temperatures occurred between December 19, 1965 and February 4, 1966, a total of 47 days. The coldest month is usually January, but January 1958 was warm with a mean temperature of -3.9°F (-20.0°C). The coldest temperature of -64°F (-53.3°C) was recorded on February 3, 1968.

May 10, 1961 was the latest date in spring, and October 17, 1960, 1964, and 1966 were the earliest dates in the fall that temperatures did not go above 32°F (0°C) all day. Sub-zero (below -17.8°C) temperatures have occurred as late as April 28 and as early as October 18. Only the 25-day period from June 28 to July 23 at Fort Simpson has been free of frost in all years.

## DEGREE-DAYS FOR GROWTH

The growing season for cool-season crops such as wheat, barley, peas, carrots, and many others is usually calculated by determining the number of degree-days above a base of 42°F (5.6°C). For example, a day with a mean temperature of 43°F (6.1°C) has 1 F (0.5 C) degree-day; a day with a mean temperature of 44°F (6.7°C) has 2 F (1.1 C) degree-days. For warm-season crops, such as corn, beans, and tomatoes the number of degree-days is calculated from a base temperature of 50°F (10.0°C).

The average daily number of degree-days for cool-season crops increases rapidly from mid-May to early July, fluctuates until early August and then decreases rapidly until late September (Figure 3). The degree-days for warm-season crops start later in May, end earlier in September, and are fewer than the degree-days for cool-season crops (Table 2).

The yearly average number of degree-days above 42°F (5.6°C) at Fort Simpson is less than at both Beaverlodge and Fort Vermilion, whereas the yearly average number of degree-days above 50°F (10.0°C) at Fort Simpson is higher than at Beaverlodge but lower than at Fort Vermilion (Table 1).

At Fort Simpson the average growing season for cool-season crops is 141 days, 30 days less than at Beaverlodge, and 60 days less than at Fort Vermilion. For warm-season crops the growing season at Fort Simpson is 106 days, 17 days less than at Beaverlodge, and 62 days less than at Fort Vermilion.

## FROST-FREE PERIODS

The average periods free of frost (above 32°F [0°C]) and of killing frost (above 28°F [-2.2°C]) are 90 and 119 days respectively at Fort Simpson. In each instance this is 8 days longer than at Fort Vermilion. In spring the average date of the last killing frost is May 18 and of the last frost June 2 (Figure 4). The average date of the first frost in the fall is August 31, and of the first killing frost is September 13.

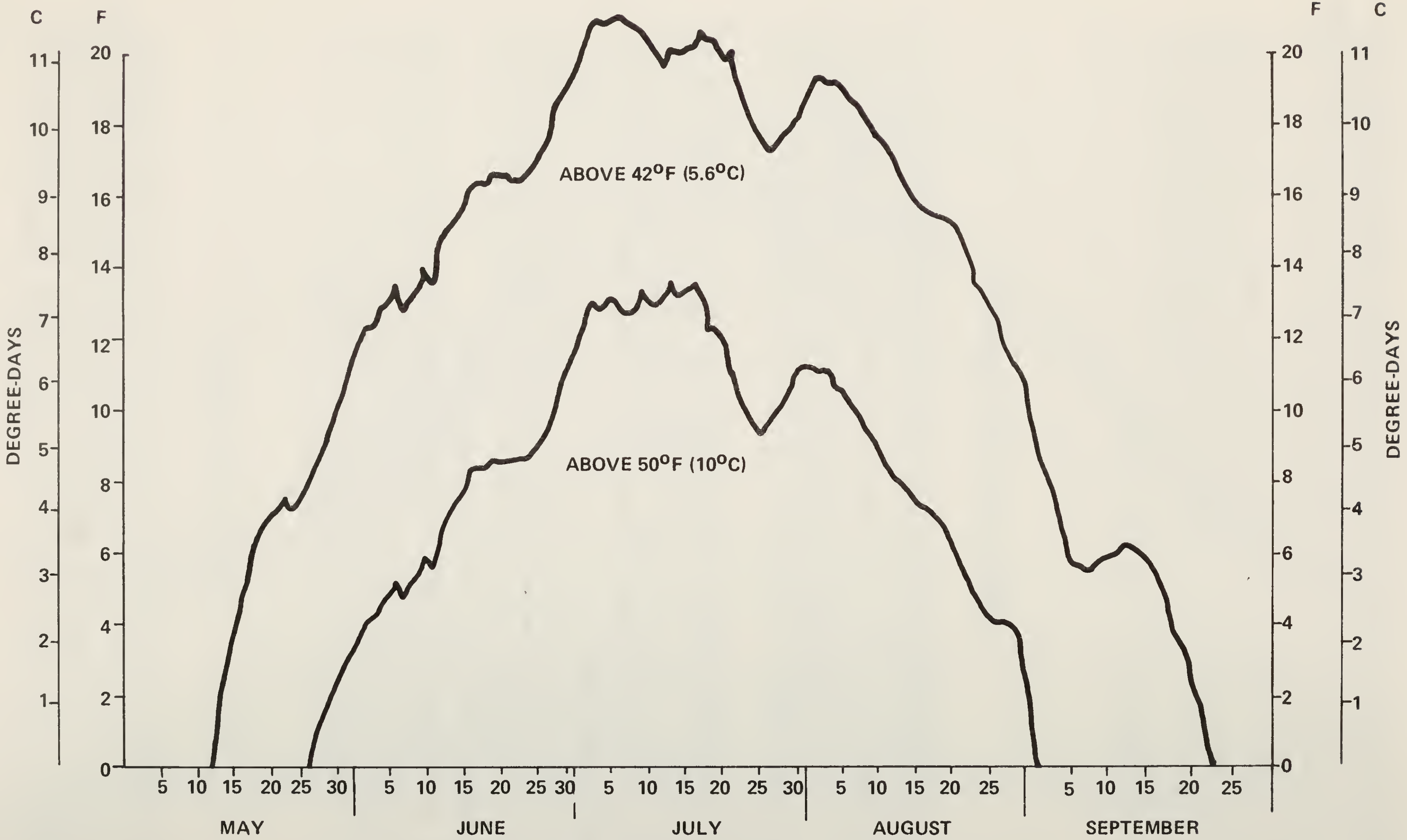

Figure 3. Average daily degree-days above 42°F (5.6°C) and 50°F (10°C) during the growing season at Fort Simpson (5-day running averages 1951-69).

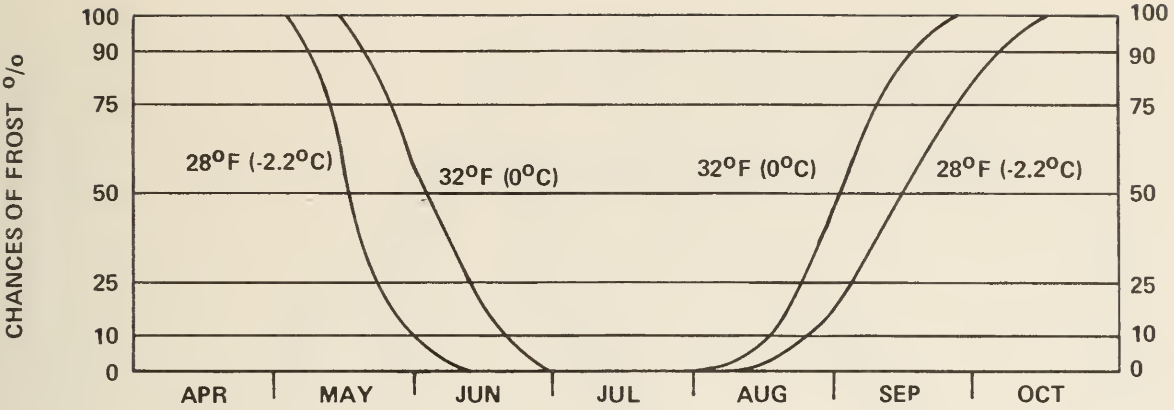

Figure 4. Chances of last frost (32°F [0°C]) and killing frost (28°F [−2.2°C]) on or after any date in spring, and of frost and killing frost on or before any date in the fall at Fort Simpson (1950-69).

## SOIL TEMPERATURES

Soil temperature at Fort Simpson is lowest in early February, increases slowly until late March, and then rapidly until the middle of June (Figure 5). From the middle of June until the middle of August, soil temperature remains fairly constant and then decreases steadily until the beginning of December and more slowly until the end of January.

Because soil gains and loses heat more slowly than air, the soil temperature fluctuates much less than air temperature. In winter, the snow cover and low sunshine intensity also reduce fluctuations in soil temperature.

During the winter, the soil temperature averages much higher than that of air and rarely falls below 15°F (−9.4°C). In summer, soil temperature 4 in. (10.2 cm) under grass sod averages only slightly more than the temperature of the air.

From the middle of June until late in August there is little difference between soil temperatures at Fort Simpson and Beaverlodge, but for the rest of the year soil temperatures at Fort Simpson are lower than at Beaverlodge.

## DAY LENGTH AND INSOLATION

Daylight is the period of the day between sunrise and sunset; civillight is the period from when the sun is 6 degrees below the horizon in the morning until the time it is in the same position in the evening. Twilight is the period from the beginning of civillight in the morning until sunrise, and from sunset to the end of civillight in the evening.

The length of the daylight period at Fort Simpson ranges from 5.0 hr on December 21 to 19.8 hr on June 21, whereas the length of the civillight ranges from 7.2 hr on December 21 to 24 hr a day from late May to the middle of July (Figure

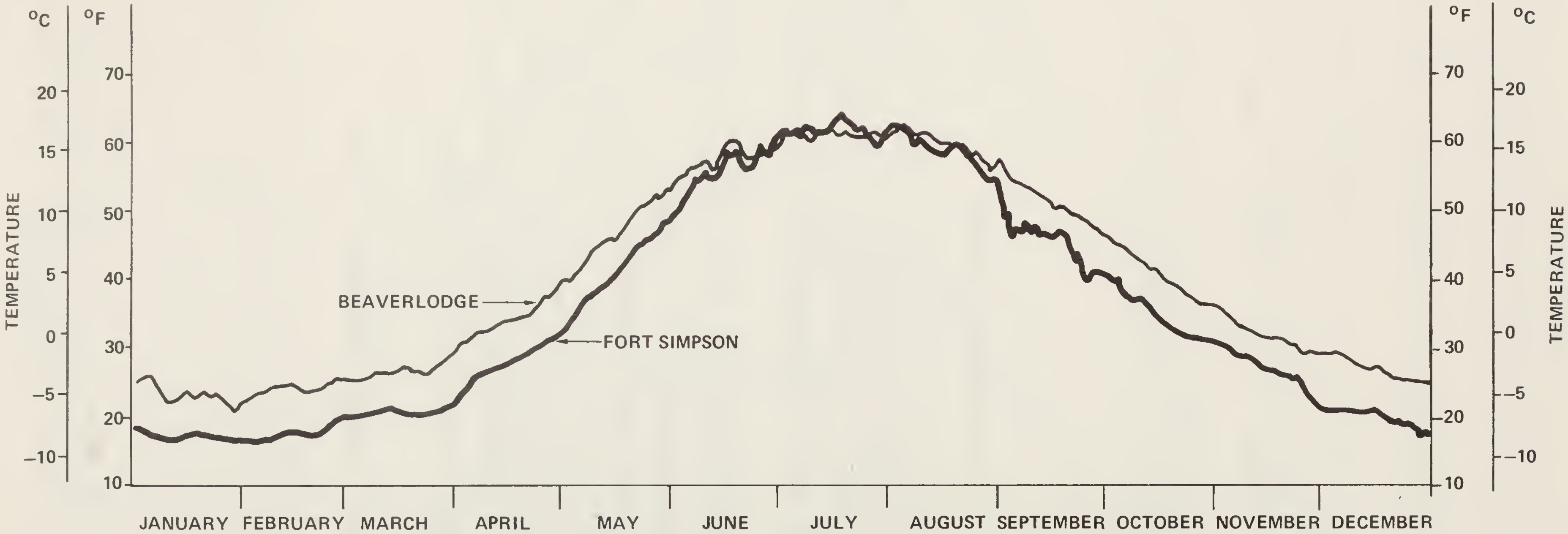

Figure 5. Comparative soil temperatures 4 in. (10.2 cm) below clipped grass sod at Fort Simpson and Beaverlodge (5-day running averages 1961-69).

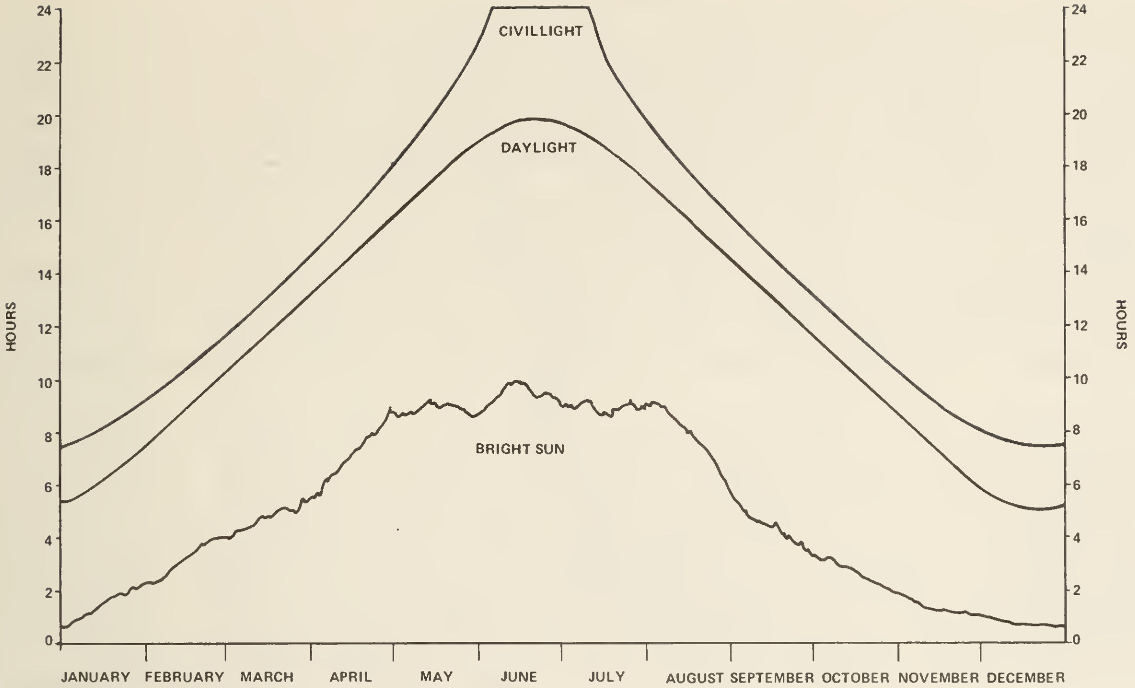

Figure 6. Daily periods of daylight and civillight, and insolation as represented by daily hours of bright sunshine (10-day running averages 1956-69).

6). The long twilight is important in the north because the 1 to 2 foot-candles of light during the twilight is sufficient for many plants to continue developing.

November, December, and early January have very little bright sunshine with as little as 18 min in the latter half of December (Figure 6). The amount of sunshine increases steadily from early January to almost 9 hr at the end of April and then more slowly to nearly 10 hr in mid-June. After the middle of June, the amount of sunshine decreases slowly to about 9 hr in early August and then rapidly until about the middle of November. Because of a slight increase in cloudiness, as indicated by the broadening of the width of the band between the daylight and bright sun curves (Figure 6), the actual sunshine is more reduced in summer than in other seasons.

## PRECIPITATION

The amount of rainfall during the growing season, when the soil is not frozen, is more important than the yearly total. Fortunately for agriculture in the Fort Simpson area, most of the precipitation occurs during this period (Figure 7). Three peak periods of rain occur. The one in June is of great assistance in aiding germination and early growth of crops. The second and largest peak occurs in late July, but is too late to be of maximum benefit to crops. The third peak is in late August and often interferes with harvesting.

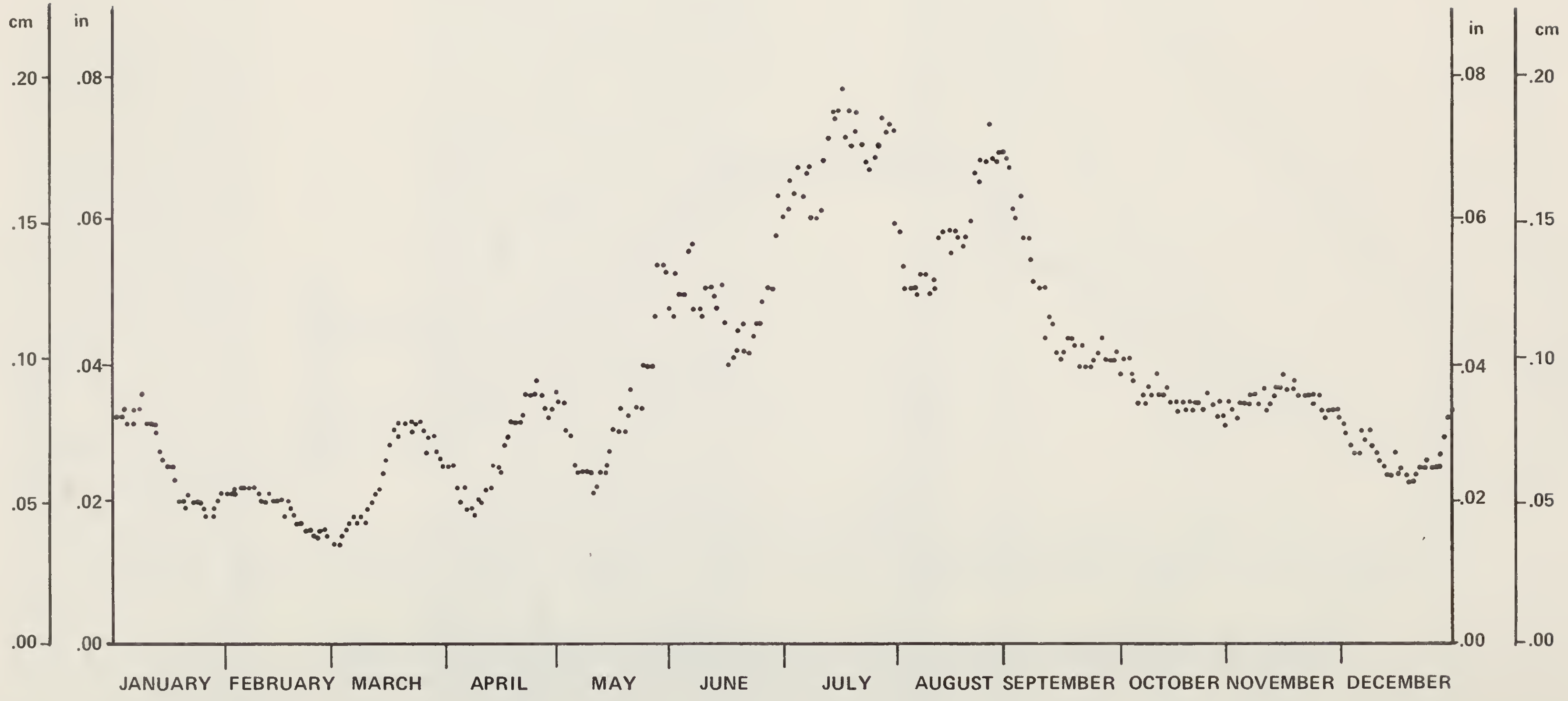

Figure 7. Average daily precipitation throughout the year (10-day running averages 1951-69).

The yearly amount of precipitation is very irregular ranging from a low of 9.2 in. (23.3 cm) in 1967 to 18.4 in. (46.6 cm) in 1950. The wettest month is usually July with an average rainfall of 2.05 in. (5.2 cm), however, rainfall in July is as variable as at any time of the year and ranged from a low of 0.26 in. (0.66 cm) in 1964 to a high of 4.88 in. (12.4 cm) in 1966. A record 2.37 in. (6.0 cm) of rain fell on July 8, 1960, which was 0.41 in. (1.0 cm) more than the next highest rainfall for one day.

Drought during the growing season occurs about 1 year in every 7 or 8 (Figure 8). The driest period recorded lasted from April to the end of September 1967, when the total rainfall for the period was only 4.99 in. (12.7 cm). The driest month, however, is usually February with an average precipitation of 0.56 in. (1.4 cm).

Winter precipitation is nearly all snow and is rather meagre. The snowfall ranged from a low of 27.5 in. (69.8 cm) in 1964 to 75.5 in. (191.8 cm) in 1956. In January 1963 a total of 24.6 in. (62.5 cm) of snow fell, the most on record at Fort Simpson. In most years, snow covers the ground from early October until late April (Figure 9). The snow gets deeper during the winter until the end of March, when rapid settling and melting begin. Winter warm spells of sufficient length or intensity to melt the snow are rare occurrences.

## EVAPORATION

Evaporation during the growing season, May to September, is lower at Fort Simpson (13.3 in. [33.8 cm]) than at Fort Vermilion (17.1 in. [43.4 cm]), Beaverlodge (22.5 in. [57.2 cm]), and southern Saskatchewan (30 in. [76 cm]).

Moisture loss by evaporation is closely related to the amounts of wind, rain, and heat received. Moisture loss is highest in June when winds and temperatures are relatively high and precipitation is low (Figure 10). Increasing precipitation and less wind reduce evaporation in July and August, whereas decreasing temperatures reduce evaporation in September. The low evaporation in August and September is also caused by heavy night dews and light rains, which slow ripening and delay harvest.

## WIND

The daily run-of-wind varies greatly at different times of the year (Figure 11). It is fortunate for man and animals that the coldest months of December through to February are the calmest. In late February the amount of wind starts increasing to reach a maximum in May, decreases again to reach a summer low in August, and then increases to a second high in November.

The May winds help to dry the soil, but because most of the land is worked during May, proper soil management is needed to prevent erosion. Although the winds of the region are seldom violent, every effort should be made to reduce them over cropped lands. Strong winds dry up valuable moisture, damage crop foliage, and abrase, lift, and carry away rich topsoil.

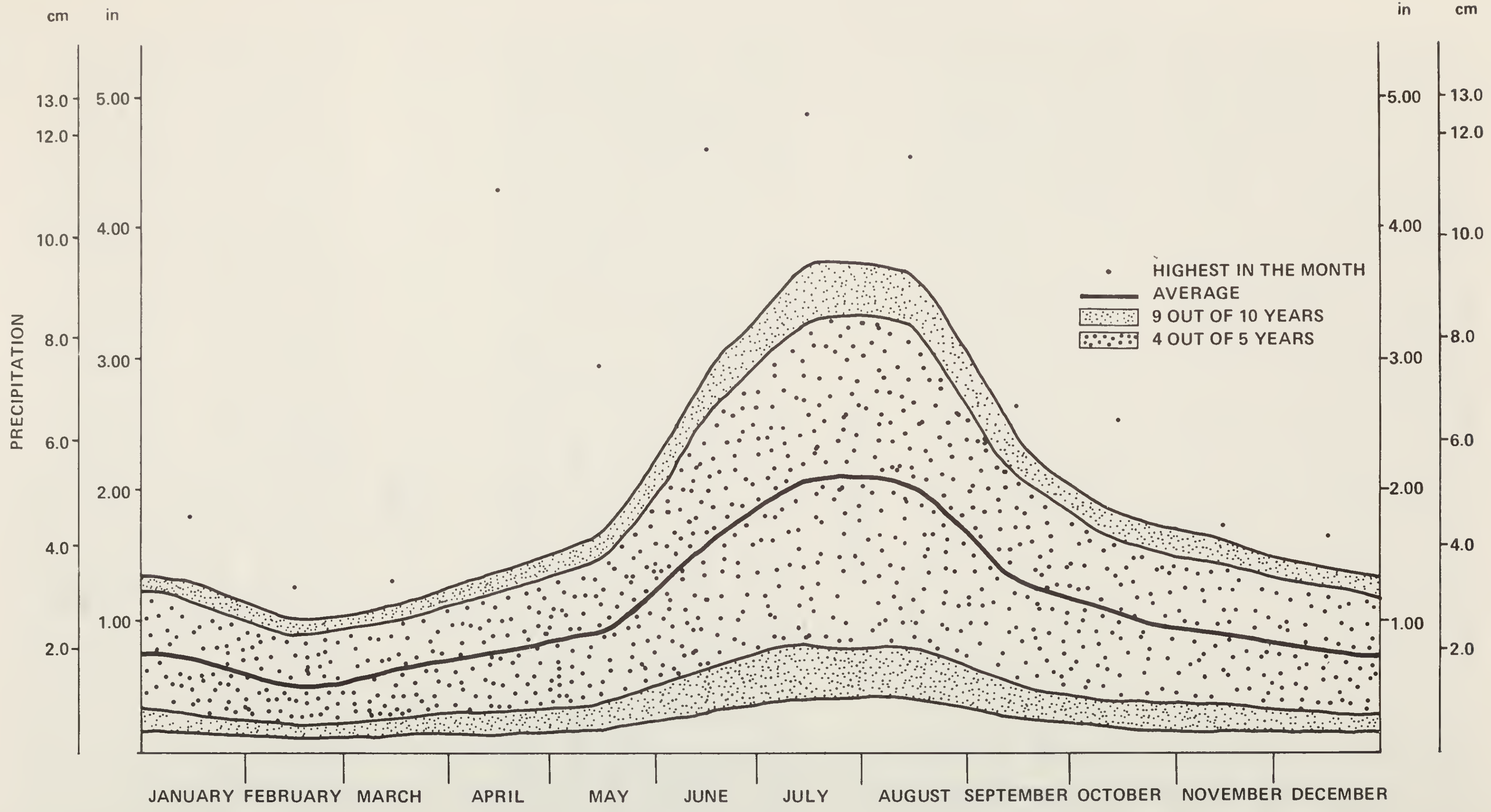

Figure 8. The average and highest monthly precipitation and the amount that can be expected each month through the year (1947-69). In 9 out of 10 yr the monthly precipitation will fall within the areas marked ░ and ▒, and in 4 out of 5 yr within the area marked ▒.

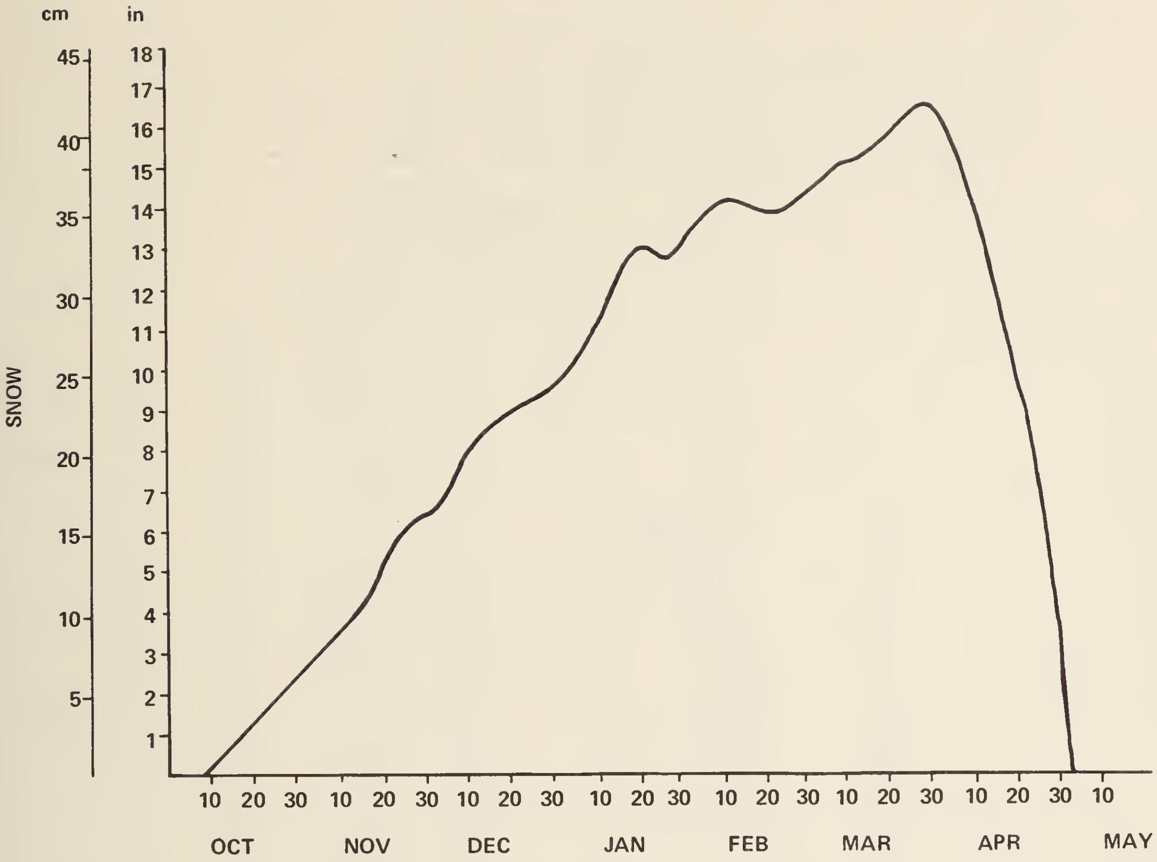

Figure 9. Average daily depth of snow throughout the winter (5-day running averages 1966-69).

Good shelterbelts can reduce evaporation, damage to plants, and soil erosion, by reducing air flow downwind for a distance of 30 times their height (Harris and Carder 1969). By retaining shelterbelts at regular intervals, snow drifting can be practically eliminated. When clearing land, strips of bush 80 to 100 ft (24 to 30 m) wide should be left every 750 to 1,000 ft (229 to 305 m) apart at right angles to the prevailing winds.

In the Fort Simpson area, prevailing winds are from the southeast (SE) 25.3% of the time, from the northwest (NW) for 24.5%, and there is no wind 21.6% of the time (Figure 12). During the middle of winter the prevailing winds are from the NW and then shift to SE for the remainder of the year (Figure 13). Thus shelterbelts running southwest (SW) to northeast (NE) should give protection from the prevailing winds at all times of the year.

## REGIONAL CLIMATES

The mean monthly air temperatures over the MacKenzie plain are relatively uniform for such an extensive area. Fort Simpson has slightly higher temperatures than the other locations from May through to August, and Fort Good Hope has lower temperatures than all locations except in May, June, and early July (Figure 14).

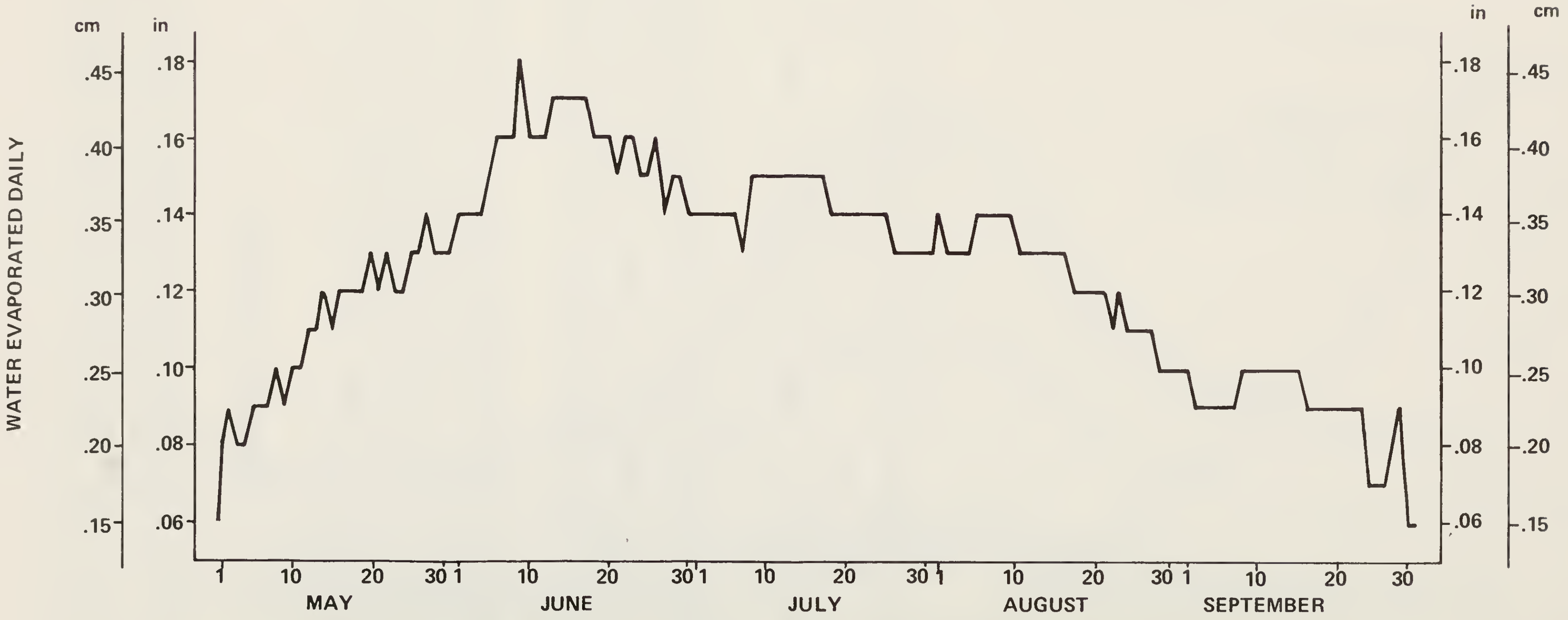

Figure 10. Average daily evaporation from black porous disc, May to September (10-day running averages 1966-69).

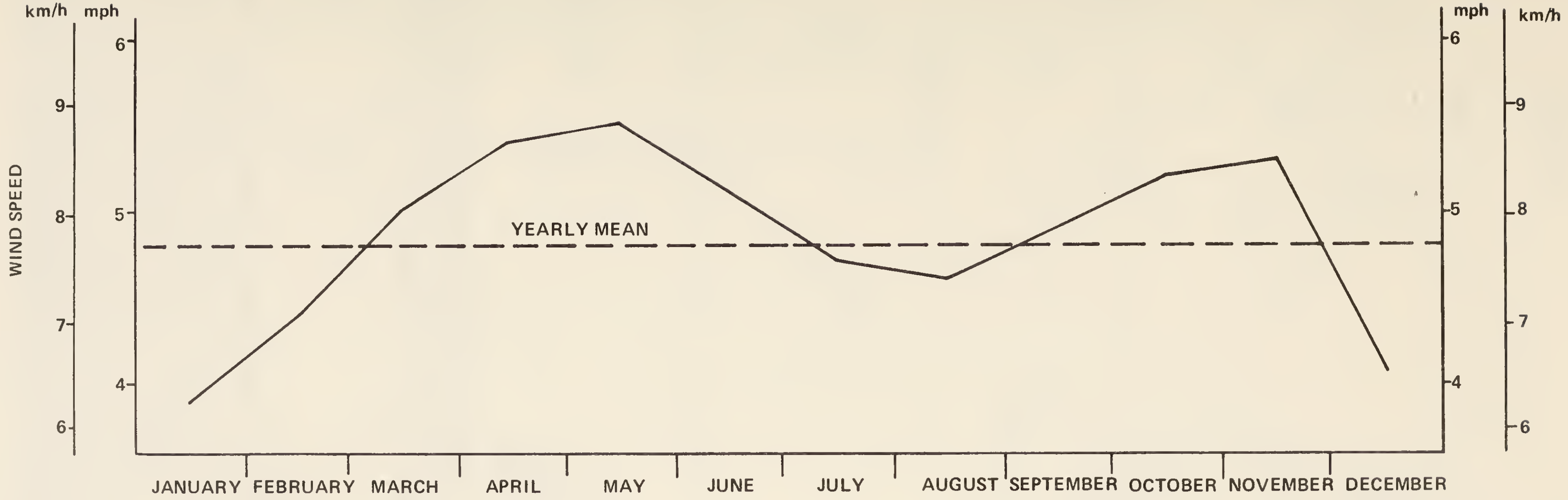

Figure 11. Average daily wind speed throughout the year (1956-69).

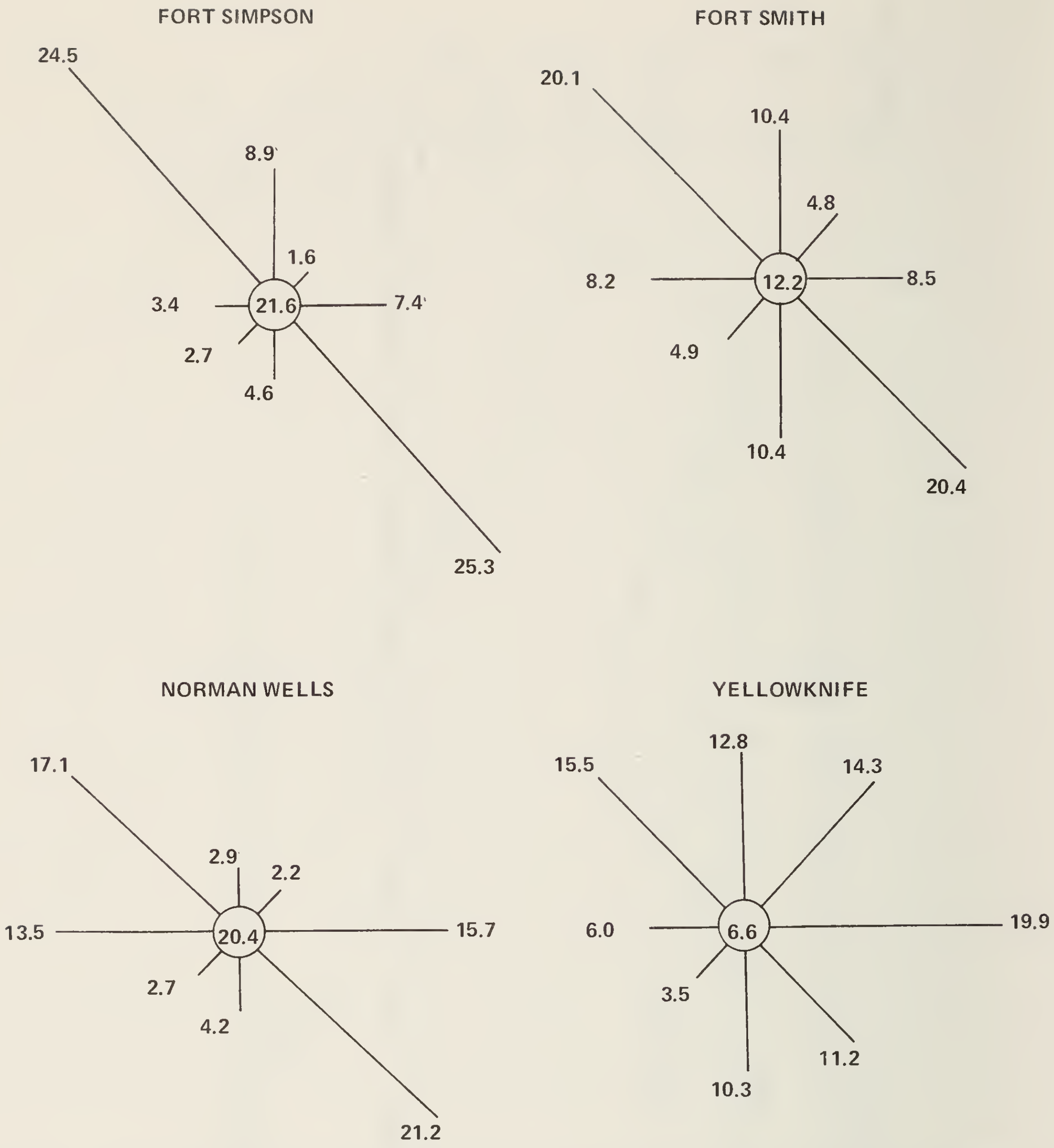

Figure 12. Prevailing winds at Fort Simpson (1956-72), Norman Wells (1956-72), Fort Smith (1955-72), and Yellowknife (1955-72). Number at end of each ray is the percentage of the period the wind was in that direction. Number in the circle is the percentage of the period it was calm.

Mean monthly precipitation varies considerably among locations from April 1 to September (Figure 15). Fort Smith has the best distribution with high precipitation during June and July to promote growth and then low rainfall in August and September, which encourages ripening. At both Fort Simpson and Fort Good Hope, the precipitation is lower than at Fort Smith in early summer and remains high during August thus delaying ripening. Yellowknife has the lowest precipitation especially during the growing season and has the least favorable precipitation distribution for crop production.

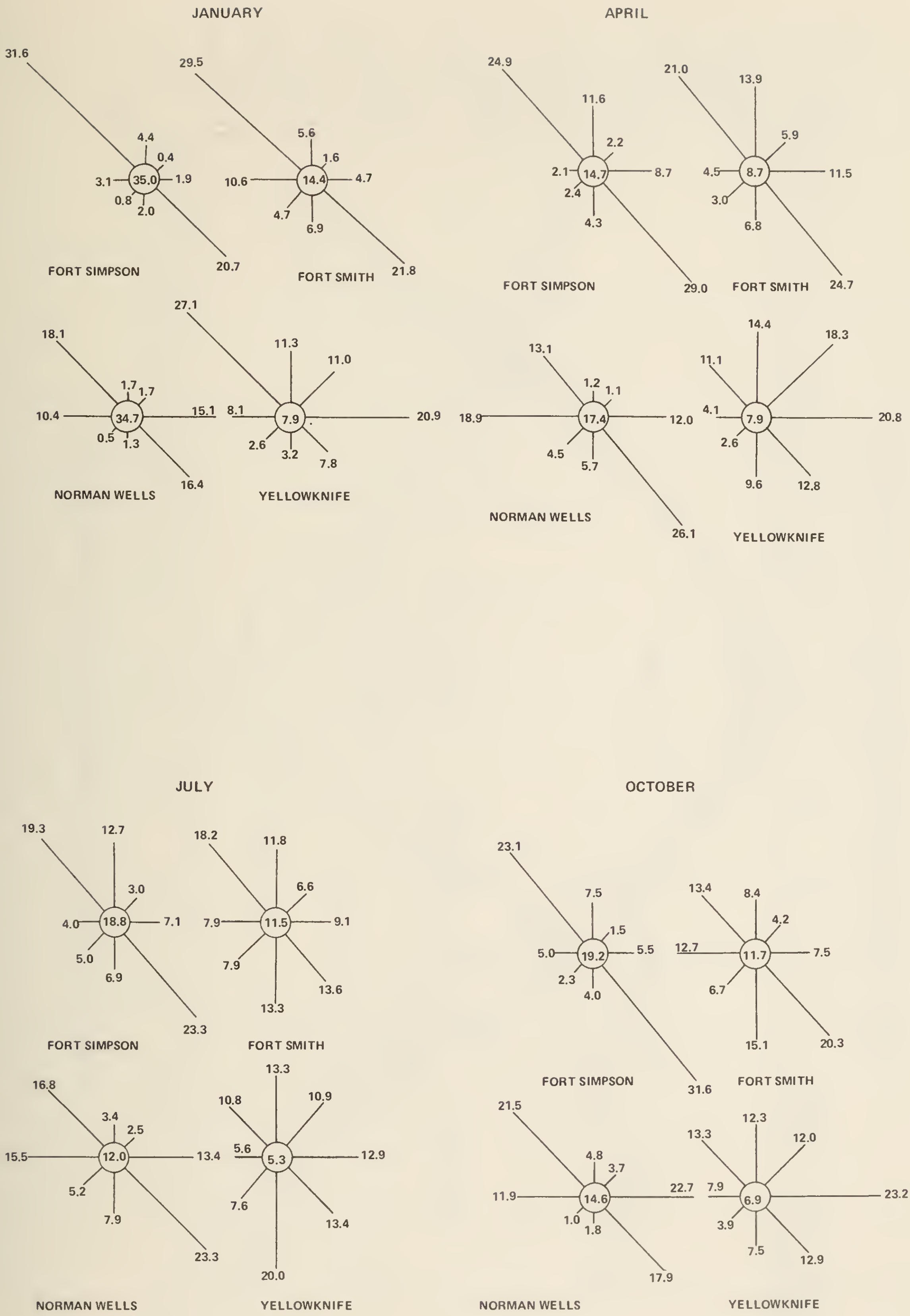

Figure 13. Average wind during January, April, July, and October at four locations for the years 1956-69. The number at the end of each ray is the percentage of the period the wind was in that direction. The number in the circle is the percentage of the period it was calm.

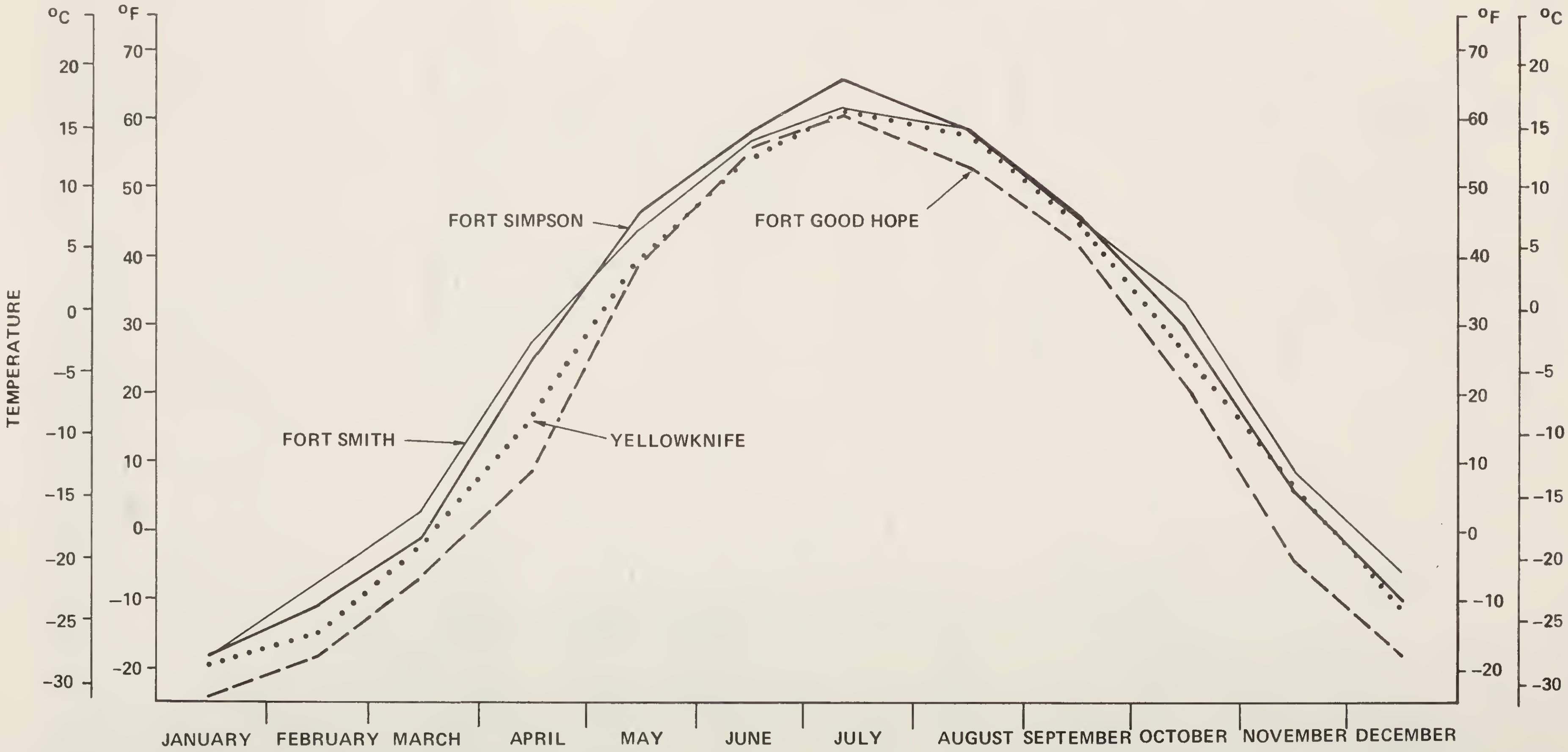

Figure 14. Mean monthly air temperatures at four locations (1947-68).

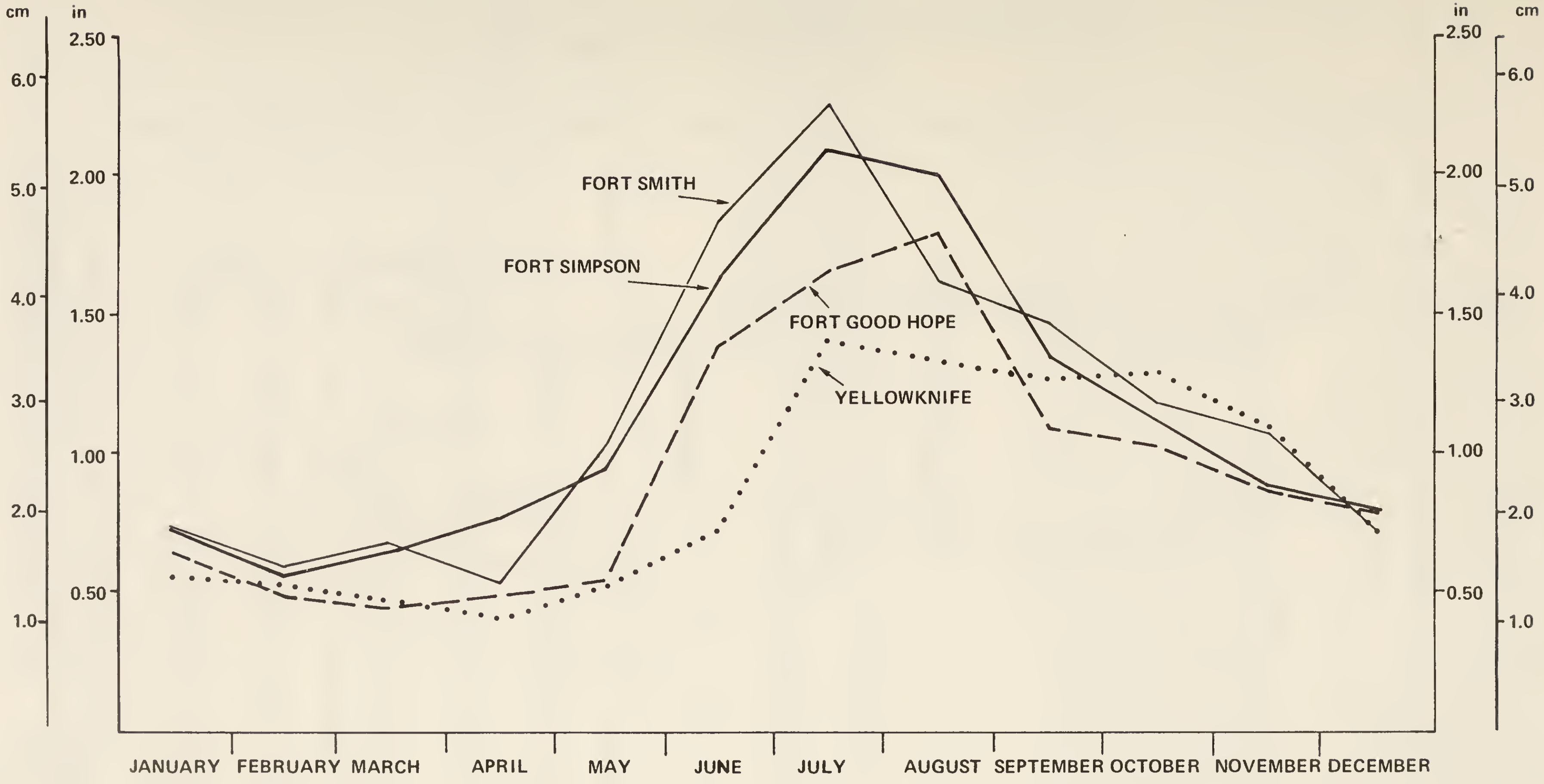

Figure 15. Mean monthly precipitation at four locations (1947-68).

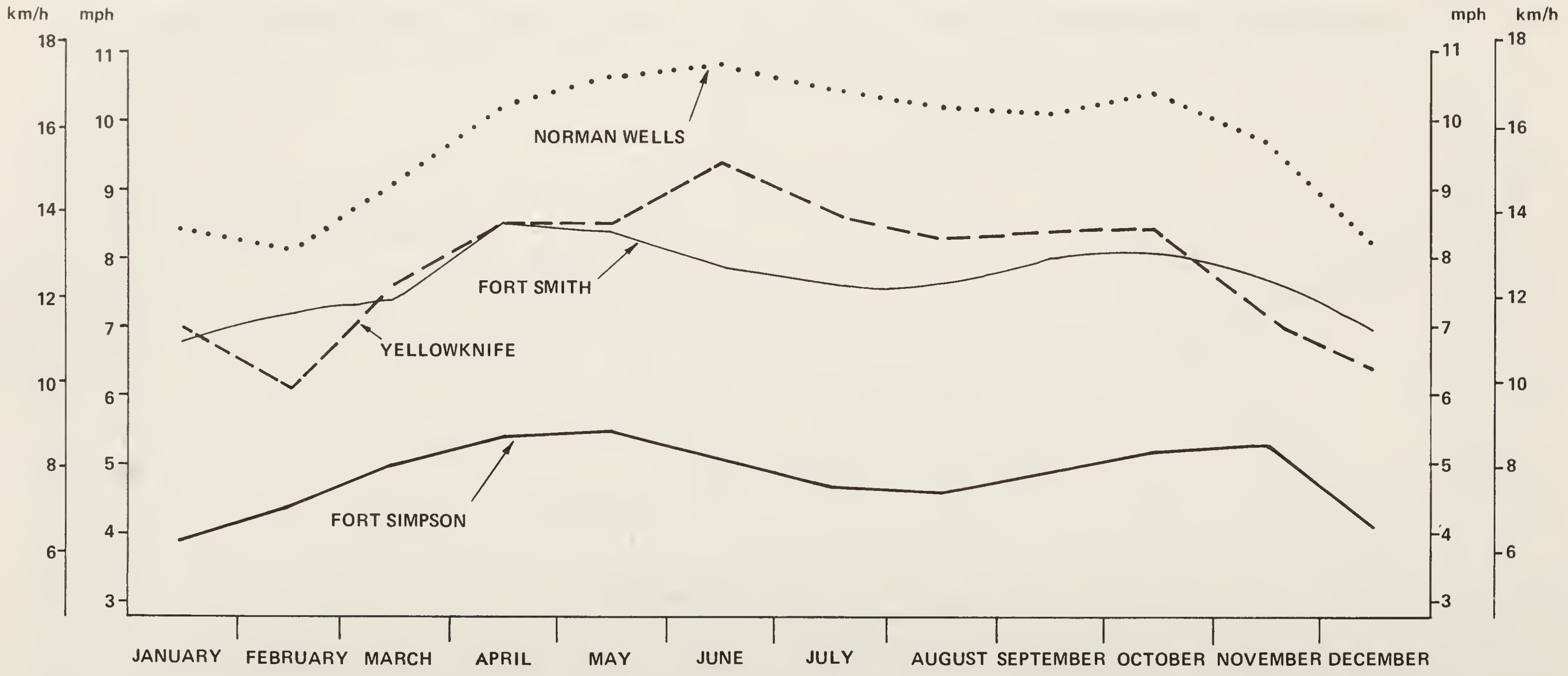

Figure 16. Mean monthly wind speed at four locations (1961-69).

At Fort Simpson the wind is the lowest of all locations, and 21.6% of the time it is calm. The least variation from month to month also occurs at Fort Simpson (Figures 12 and 16). Norman Wells has the most wind, but it is calm 20.4% of the time. Yellowknife has the greatest differences in wind speed between seasons and also the least period of calm (6.6%). At Fort Simpson and Fort Smith the greatest amount of wind occurs in April and May, whereas at Norman Wells and Yellowknife the greatest amount occurs in June. A second peak occurs at all locations in October or November.

January is the only month of the year when the prevailing wind is from the same direction (NW) at all locations (Figure 13). At Yellowknife the prevailing winds are from the NW during January and February, from the S in July, and from the E for the rest of the year. Northwest winds prevail during November through January at Norman Wells, then shift to SE during February through August, and then E during September and October. At Fort Smith the prevailing winds shift every 3 months, they are from the NW during January through March and again from July through September, and from the SE the other 6 months of the year.

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## CONVERSION FACTORS FOR METRIC SYSTEM

| Imperial units | Approximate conversion factor | Results in: | |
|---|---|---|---|
| LINEAR | | | |
| inch | x 25 | millimetre | (mm) |
| foot | x 30 | centimetre | (cm) |
| yard | x 0.9 | metre | (m) |
| mile | x 1.6 | kilometre | (km) |
| AREA | | | |
| square inch | x 6.5 | square centimetre | (cm$^2$) |
| square foot | x 0.09 | square metre | (m$^2$) |
| acre | x 0.40 | hectare | (ha) |
| VOLUME | | | |
| cubic inch | x 16 | cubic centimetre | (cm$^3$) |
| cubic foot | x 28 | cubic decimetre | (dm$^3$) |
| cubic yard | x 0.8 | cubic metre | (m$^3$) |
| fluid ounce | x 28 | millilitre | (mℓ) |
| pint | x 0.57 | litre | (ℓ) |
| quart | x 1.1 | litre | (ℓ) |
| gallon | x 4.5 | litre | (ℓ) |
| bushel | x 0.36 | hectolitre | (hℓ) |
| WEIGHT | | | |
| ounce | x 28 | gram | (g) |
| pound | x 0.45 | kilogram | (kg) |
| short ton (2000 lb) | x 0.9 | tonne | (t) |
| TEMPERATURE | | | |
| degree fahrenheit | °F-32 x 0.56<br>(or °F-32 x 5/9) | degree Celsius | (°C) |
| PRESSURE | | | |
| pounds per square inch | x 6.9 | kilopascal | (kPa) |
| POWER | | | |
| horsepower | x 746 | watt | (W) |
| | x 0.75 | kilowatt | (kW) |
| SPEED | | | |
| feet per second | x 0.30 | metres per second | (m/s) |
| miles per hour | x 1.6 | kilometres per hour | (km/h) |
| AGRICULTURE | | | |
| bushels per acre | x 0.90 | hectolitres per hectare | (hℓ/ha) |
| gallons per acre | x 11.23 | litres per hectare | (ℓ/ha) |
| quarts per acre | x 2.8 | litres per hectare | (ℓ/ha) |
| pints per acre | x 1.4 | litres per hectare | (ℓ/ha) |
| fluid ounces per acre | x 70 | millilitres per hectare | (mℓ/ha) |
| tons per acre | x 2.24 | tonnes per hectare | (t/ha) |
| pounds per acre | x 1.12 | kilograms per hectare | (kg/ha) |
| ounces per acre | x 70 | grams per hectare | (g/ha) |
| plants per acre | x 2.47 | plants per hectare | (plants/ha) |

Examples: 2 miles x 1.6 = 3.2 km; 15 bu/ac x 0.90 = 13.5 hℓ/ha

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